

# **Western Power**

## **2011/12 Network Quality and Reliability of Supply Code Audit**

**September 2012**

### **Limitations of use**

This report is made solely for the management of Western Power for the purpose of its reporting requirements under sections 26 and 27 of the Electricity Industry (Network Quality and Reliability of Supply) Code 2005. We disclaim any assumption of responsibility for any reliance on this report to any person other than the management of Western Power, or for any purpose other than that for which it was prepared. We disclaim all liability to any other party for all costs, loss, damages, and liability that the other party might suffer or incur arising from or relating to or in any way connected with the contents of our report, the provision of our report to the other party, or the reliance on our report by the other party.

Mr David Fyfe  
Branch Manager Network Performance  
Western Power  
363 Wellington Street  
PERTH WA 6000

14 September 2012

Dear David

## **2011/12 Network Quality and Reliability of Supply Code Audit**

We have completed the Network Quality and Reliability of Supply Audit for Western Power for the period 1 July 2011 to 30 June 2012 and are pleased to submit our report to you.

I confirm that this report is an accurate presentation of the findings and conclusions from our audit procedures.

If you have any questions or wish to discuss anything raised in the report, please contact Andrew Baldwin on 9365 7236 or me on 9365 7024.

Yours sincerely



**Richard Thomas**  
Partner

# Contents

Executive summary	3
Operating systems	8
Quality of supply	10
Reliability of supply	13
Variations	20
Appendix A – Compliance requirements	21
Appendix B – References	22
Appendix C – Voltage fluctuation and harmonic tables	24

Deloitte refers to one or more of Deloitte Touche Tohmatsu Limited, a UK private company limited by guarantee, and its network of member firms, each of which is a legally separate and independent entity. Please see [www.deloitte.com/au/about](http://www.deloitte.com/au/about) for a detailed description of the legal structure of Deloitte Touche Tohmatsu Limited and its member firms.

For more information, please visit Deloitte’s web site at [www.deloitte.com.au](http://www.deloitte.com.au).

Confidential - this document and the information contained in it are confidential and should not be used or disclosed in any way without our prior consent.

© 2012 Deloitte Touche Tohmatsu. All rights reserved.

# Executive summary

## Background

In accordance with Part 4, Division 3, section 26 of the Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (the **Code**), Western Power is required to arrange for an independent audit of systems that are in place to monitor compliance with Part 2 of the Code or an instrument made under section 14(3) of the Code.

Western Power appointed Deloitte to undertake the audit for the year ending 30 June 2012.

## Objective

The objective of this audit is to assess and report on the operation of the systems implemented by Western Power to monitor its compliance with Part 2 of the Code or an instrument made under section 14(3) for the 2011/12 financial year.

The relevant compliance requirements of the Code are listed at **Appendix A**.

This audit focuses on Western Power's systems and processes for monitoring compliance and does not assess the level of compliance achieved or the validity of the information reported in the Annual Reliability and Power Quality report.

## Scope

The scope of this audit relates directly to the four divisions at Part 2 of the Code. The key elements of each division are explained below:

Audit area	Description
Quality of Supply (Division 1)	Power quality standards for quality of supply at the point of connection to the customer, specifically relating to voltage fluctuations and harmonic distortion.
Reliability of Supply (Division 2)	Standards for the interruption of supply to individual customers provide for the maintenance of supply and management of interruptions to customers, both in terms of the duration and number of interruptions. Those standards address the following: <ul style="list-style-type: none"> <li>• Provision of supply with the minimum number and duration of interruptions</li> <li>• Consideration of providing alternative supply if the interruption is expected to be significant, its effect substantial or if the customer has special health needs that require continuous supply</li> <li>• Allowing planned interruptions if the customer is notified within a suitable time and where the duration is under 6 hours, or under 4 hours for forecast temperatures over 30 degrees</li> <li>• Provision for the distributor to remedy the causes of interruptions to small use customers or enter into alternative arrangements if the supply has been interrupted for more than 12 hours continuously, or more than the permitted number of times in the preceding year ending 30 June and it is considered that the prescribed standard is unlikely to be met for the customer.</li> </ul>

Audit area	Description
Interruptions of supply standards (Division 3)	Standards for the duration of interruptions of supply in particular areas, provides so far as is reasonably practicable that the average length of interruptions be less than 30 minutes within the Perth CBD, less than 160 minutes for urban areas other than the Perth CBD and less than 290 minutes in any other area of the State, (calculated as average of the yearly averages over 4 years).
Variation to obligations under Part 2 of the Code (Division 4)	Variations to obligations under Part 2 of the Code relate to: <ul style="list-style-type: none"> <li>• Review and approval by the Minister of applications for alternative provisions made under section 14(3) of the Code</li> <li>• Agreement between transmitter/distributor and customers to exclude or modify a provision of Part 2, in relation to the supply of electricity.</li> </ul>

## Approach

Our approach for this audit involved the following activities, which were undertaken during June, July and August 2012:

- Completion of a risk assessment, using the guidance provided by the Economic Regulation Authority (the **Authority**) Audit Guidelines: Electricity Gas and Water Licenses and the Electricity Compliance Reporting Manual (**Reporting Manual**). The risk assessment was designed to direct the audit to higher risk areas requiring compliance monitoring, with more audit effort applied to higher risk areas
- Preparation of an Audit Plan to outline the scope, purpose, timing and focus of the audit, the approach to be used in undertaking the audit and the deliverables of the audit. The Audit Plan and risk assessment were presented to Western Power for consideration and comment prior to being finalised
- Entry meeting with key representatives of Western Power's Network Performance Branch
- Examination of the Code to fully understand Western Power's related obligations. The Reporting Manual was referenced
- Attendance at presentations by relevant operational level Western Power staff to gain an understanding of the mechanisms in place (including relevant IT systems, referenced at the operating systems section of this report) to achieve and monitor compliance with the Code (refer to **Appendix B** for staff involved)
- Consideration of actions taken by Western Power in respect to opportunities for improvement identified in the 2010/11 Network Quality and Reliability of Supply Code audit report
- Walkthrough of processes, controls and systems and examination of documents to determine whether Western Power has processes in place to achieve and monitor compliance (refer **Appendix B** for reference listing)
- Reporting of findings to Western Power for review.

This report has been prepared to provide a clear understanding of Western Power's obligations under the Code and the systems in place for monitoring its compliance with those obligations. The report is structured to align to the four divisions of Part 2 of the Code. Each section of this report addresses:

- *Code requirement*: a summary of the specific Code requirements providing context for the observations of the report and clarity on Western Power's actual obligations
- *Western Power's mechanisms and systems designed to meet Code requirements*: this part of the report provides context on those operational mechanisms Western Power has established (e.g. through the use of the TCS system and other systems highlighted below) to meet its obligations for maintaining network quality and reliability of supply in accordance with the Code requirements
- *Western Power's mechanisms and systems designed to monitor compliance with Code requirements*: this section of the report is the key focus of the audit, addressing the mechanisms Western Power has in place to monitor its compliance with the relevant sections of the Code. For example, exception reporting arrangements and compliance specific activities to consider the impact of events on compliance
- *Opportunities for improvement*: where the audit has identified either a deficiency in mechanisms designed to achieve/monitor compliance or an opportunity for further strengthening those mechanisms.

## Responsibility

### Western Power's responsibility for compliance with the requirements of the Code

Western Power is responsible for:

- Putting in place policies, procedures and controls, which are designed to ensure compliance with the requirements of the Code
- Implementing processes for assessing its compliance obligations and for monitoring its level of compliance.

### Deloitte's responsibility

Our responsibility is to express an opinion on Western Power's systems established for monitoring its compliance with Part 2 of the Code, for the year ending 30 June 2012, based on the procedures we performed. We conducted our engagement in accordance with the Audit Guidelines and the Australian Standard on Assurance Engagements (ASAE) 3500 *Performance Engagements*<sup>1</sup> issued by the Australian Auditing and Assurance Standards Board, in order to state whether, in our opinion, based on the procedures performed, Western Power has established and operated systems for monitoring its compliance with Part 2 of the Code, for the 2011/12 financial year. Our engagement provides reasonable assurance as defined in ASAE 3500.

---

<sup>1</sup> ASAE 3500 also provides for our engagement to be conducted in accordance with relevant requirements of ASAE 3000 *Assurance Engagements Other than Audits or Reviews of Historical Financial Information*.

### Limitations of use

This report is intended solely for the management of Western Power, for the purpose of their reporting requirements under sections 26 and 27 of the Code and is not intended to be and should not be used by any other person or entity. No other person or entity is entitled to rely, in any manner, or for any purpose, on this report. We do not accept or assume responsibility to anyone other than Western Power for our work, for this report, or for any reliance which may be placed on this report by any party other than Western Power.

### Inherent limitations

Reasonable assurance means a high but not absolute level of assurance. Absolute assurance is very rarely attainable as a result of factors such as the following: the use of selective testing, the inherent limitations of internal control, the fact that much of the evidence available to us is persuasive rather than conclusive and the use of judgement in gathering and evaluating evidence and forming conclusions based on that evidence.

We cannot, in practice, examine every activity and procedure, nor can we be a substitute for management's responsibility to maintain adequate controls over all levels of operations and their responsibility to prevent and detect irregularities, including fraud. Accordingly, readers of our report should not rely on the report to identify all potential instances of non-compliance which may occur.

### Independence

In conducting our engagement, we have complied with the independence requirements of the Australian professional accounting bodies.

## Summary of findings

In considering the systems in place which enable Western Power to monitor its compliance with Part 2 of the Code, this audit recognises that Western Power has:

- Established a range of mechanisms and systems designed to meet its obligations for maintaining network quality and reliability of supply in accordance with Code requirements
- Established an organisation-wide compliance framework, which is intended to address key compliance requirements and activity, including recognition of instances of non-compliance
- Throughout the year ending 30 June 2012, implemented a number of enhancements to processes and systems designed to assist with monitoring compliance with Part 2 of the Code
- In accordance with formal action plans prepared in response to opportunities for improvement raised by the 2011 audit, already completed or scheduled further enhancements to compliance monitoring processes to be made during the 2012/13 financial year
- One opportunity to further strengthen its mechanisms and systems to more effectively monitor its compliance with Part 2, Division 2 of the Code, through the implementation of a formal procedure regarding its validation checklist and rules used to recognise breaches of section 9 requirements. This issue is further detailed in the Reliability of Supply section of this report - refer to *1/2012: Validation checklist – formal procedure*.

## Conclusion

In our opinion, based on the procedures performed for the year ending 30 June 2012:

- Except for the effect of any issues set out below, Western Power has in all material respects, established and operated systems designed to meet its obligations under Part 2 of the Code
- Western Power had the following further opportunities to improve its systems designed to effectively monitor its compliance with Part 2, Division 2 of the Code through:
  - (a) The implementation of a formal procedure regarding its validation checklist and rules used to recognise breaches of section 9 requirements
  - (b) The clear interpretation of which interruptions are considered to be breaches (i.e. not allowable planned interruptions) of the requirements of Division 2 of the Code for monitoring and reporting purposes. This opportunity for improvement was subsequently addressed in July 2012.

# Operating systems

Western Power utilises the following systems and tools to help achieve its compliance and performance requirements under its distribution and transmission licences. These systems and tools also form part of the mechanisms designed to enable Western Power to monitor its compliance with Part 2 of the Code.

System	Description
Electricity Network Management and Control (ENMAC)	<p>ENMAC is a Distribution Management System (DMS) supplied by GE Energy. The system is comprised of the following modules:</p> <ul style="list-style-type: none"> <li>• Network Management</li> <li>• SCADA</li> <li>• Limit Manager</li> <li>• Distribution Power Analysis</li> <li>• Advanced User Interface</li> <li>• Data Historian</li> <li>• HV Webview (Reporting)</li> <li>• Trouble Call System.</li> </ul> <p>The base DMS system was implemented in 2003 with the TCS module being added in 2008. The HV Webview interface provides users with a web interface to utilise the data within TCS. ENMAC has been established with varying levels of user access, dependant on the information required by the user.</p>
Trouble Call System (TCS)	<p>TCS is a module of ENMAC. The TCS module was implemented in late 2008, replacing the Trouble Call Management System. TCS is designed:</p> <ul style="list-style-type: none"> <li>• As a central system, primarily used by the Network Operations Control Centre (NOCC) to monitor and facilitate a response to unplanned outages (faults) and to monitor planned outages</li> <li>• To maintain the network fault database from which statistics for network quality and reliability of supply performance are monitored.</li> </ul> <p>Western Power's redundancy strategy for TCS includes five redundant servers in replication.</p>
Distribution Quotation Management (DQM) system	<p>DQM is a job tracking and estimation tool utilised broadly within Western Power. For the purposes of the audit, DQM is primarily utilised to plan and cost works to parts of Western Power's network, which may be as a result of power quality complaints or scheduled planned works.</p>
Data Warehouse	<p>The Data Warehouse comprises the servers used to house read only TCS and Metering Business System (MBS) data for the purposes of reporting (specifically including reliability reporting, network planning and EOPS). Access to change or alter data is limited to members of the Extract Transform Load (ETL) team. Any change requests must be approved by the business and records maintained.</p>

System	Description
Permanent Power Quality Monitoring devices (permanent PQ devices)	<p>108 permanent PQ devices have been installed at select points on Western Power's network to collate quality of supply data. Following a study carried out by the University of Wollongong that identified the ideal number of permanent PQ devices for most effective coverage of Western Power's network, Western Power plans to increase the number of devices to a total of 360 in the next five years. Permanent PQ devices are installed on the Low Voltage (LV) network in pairs, one at the distribution transformer and one at a customer premises near the end of the LV feeder. The devices:</p> <ul style="list-style-type: none"> <li>• Provide an indication of the power quality performance of an LV feeder</li> <li>• Are remotely monitored and data retrieved is stored in the PI database. Each device provides data in 5 minute intervals.</li> </ul> <p>Should a device be faulty (e.g. breakdown in a communication link or the device itself) an automated email is sent to the Power Quality email account. We understand that each device can accumulate 12 days of data.</p> <p>Supporting the permanent PQ devices are temporary 'logger' units that can be installed at customer premises to investigate quality of supply complaints.</p>
Extended Outage Payment System (EOPS)	<p>EOPS is a Lotus Notes application developed to facilitate extended outage claims by and relevant payments made to customers affected by extended (not planned) outages.</p> <p>Once a claim is submitted by the customer, either by mail or online, EOPS performs a number of checks, including validating the:</p> <ul style="list-style-type: none"> <li>• Customer to MBS, either by National Meter Identifier (NMI) number or customer name</li> <li>• Address to a customer listing within Lotus</li> <li>• Outage by comparing the NMI and date to TCS.</li> </ul> <p>Claims that are not approved through the above process are listed and manually reviewed to determine whether the claim is invalid. We understand this step was implemented as requests for service standard payments were being rejected even where a valid fault had occurred. Potential causes of such discrepancies are:</p> <ul style="list-style-type: none"> <li>• The Data Warehouse not updated with TCS data, if claim was received prior to warehouse updates</li> <li>• Customer incorrectly completes form which results in failed validation of a field e.g. address or NMI.</li> </ul>

# Quality of supply

## Division 1 - Quality standards

### Code requirement

Division 1 of the Code outlines the standards for quality of supply at the point of connection to the customer, specifically relating to:

- Voltage fluctuations and harmonic distortion (sections 5(1), 6(2) and 7)
- Disconnection of customers where there is a possibility of damage to the customers' installation (section 8).

### Mechanisms and systems designed to meet Code requirements

#### Observation of standards for voltage fluctuation and harmonics

Western Power is required to comply with the quality of supply requirements detailed in sections 6(2) and 7 of the Code (refer to **Appendix C** of this report for specific details). For the purposes of this Division we understand that power quality relates to either 'flicker' (voltage fluctuations) or harmonic distortions noticed by the customer. For these items to be recognised as power quality concerns they must be repetitive, but not result in de-energisation.

We understand that Western Power has both proactive and reactive mechanisms for monitoring power quality performance:

- (a) Proactive monitoring is conducted using permanently installed PQ devices which show the overall performance of the network on a sample basis.
- (b) Reactive monitoring uses PQ devices that are installed in response to a customer complaint (the primary source used for recognising power quality issues experienced at the customer level) to help diagnose the PQ problem in relation to the customer's connection point.

#### Recognition of network quality issues

Western Power's Power Quality Complaints Procedure indicates that:

- Western Power's response to network quality issues is reliant on the customer lodging a complaint with either the Customer Assist call centre (logged via NetCIS) or the fault line (logged via TCS, managed by the Network Operation Control Centre (**NOCC**)). The 2011 audit report (opportunity for improvement 1/2011) identified the potential for disparate complaints records between NetCIS and TCS. We understand that:
  - The Customer Assist Branch and NOCC have now confirmed that it is feasible to report on complaints logged in both NetCIS and TCS
  - The process to report on complaints in each of NetCIS and TCS will be included in the development of the overall Network Quality and Reliability of Supply reporting guideline (due for completion by December 2012).
- Once a customer has lodged a complaint or fault, Western Power can initiate its investigation processes to determine whether there are issues with power quality at the customer premises. Western Power's standard process is to install a power quality monitoring device to assist with analysing the issue

- Should issues be identified, Western Power applies its standard operations for implementing remedial actions to correct power quality issues.

#### Reporting of network quality performance

Western Power has developed a Power Quality procedure for Regulatory Reporting to facilitate its power quality reporting obligations under the Code. The primary source of data for the Regulatory Report is the permanent PQ devices.

The Power Quality team:

- Produces a quarterly “LV Network Power Quality Compliance with Electricity Industry Code 2005 and Electricity Industry Act 1945” report. The report details:
  - Steady state voltage (frequency histogram)
  - Harmonic distortion (frequency histogram, including the percentage of total harmonic distortion occurrences within the 8% compliance level, therefore identifying whether any non-compliances exist and the proportion of the time the non-compliance existed)
  - Voltage unbalance compliance (not required by the Code, nor considered by this audit)  
Note that voltage fluctuations and individual harmonic components are not reported as permanent PQ devices are not designed to measure this metric.
- Contributes details on power quality complaints per 100,000 customers (as a key measure of network quality) to:
  - The monthly Network Performance Branch report, which also includes numerous measures relating to reliability of supply
  - The annual Reliability and Power Quality report, including power quality complaints by category.

The Power Quality team has re-assessed the level of data and information used to monitor its power quality performance and considers that data and information to be the most relevant currently available.

In June 2012 Western Power implemented a new Power Quality Non-compliance Reporting procedure. The procedure has been developed to guide staff on the process to be followed for reporting any breach of the power quality metrics as detailed by sections 6(2) and 7 of the Code, including any escalation requirement and compliance failure reporting.

#### **Duty to disconnect**

The Team Leader - Power Quality Management Team advised that:

- To the best of his knowledge, in recent years, Western Power has not disconnected a customer where the voltage fluctuations and harmonic distortion levels breached the requirements of section 6(2) and 7 of the Code
- Western Power’s voltage fluctuations and harmonic planning levels are designed so that they will not breach the required sections of the Code.

#### Disconnection of a customer

The Team Leader - Power Quality Management Team advised that in the event that a customer’s installation requires disconnection due to voltage fluctuations and harmonic distortion exceeding the requirements of the Code, as part of the power quality investigation process consideration is given as to whether or not the customer should be disconnected to

prevent damage to the installation or property, unless it is in the interest to maintain supply. During the year ending 30 June 2012, the Power Quality Complaint Handling Process Manual was updated to include seven additional steps to demonstrate (in compliance with section 8 of the Code) the considerations taken to disconnect a customer where instances of voltage and harmonic distortion may cause damage to customer installations.

### Mechanisms designed to monitor compliance with Code requirements

Western Power has installed permanent PQ devices on its network to proactively monitor network quality performance. To 30 June 2012, Western Power had installed 108 devices, with a plan to increase numbers over the next five years to a total of 360 devices at targeted locations. This number of permanent PQ devices was adopted from a study completed by the University of Wollongong which concluded on the ideal number of devices required to provide effective coverage across the network. The current number and location of permanent PQ devices provides Western Power with network quality data on a sample basis.

This audit also determined that in June 2012, Western Power issued the procedure “Configuring PQ Instruments and Storing Data for Power Quality Measurement” for monitoring of flicker and individual harmonic components using portable PQ instruments. The procedure was also rolled out to field staff in June 2012.

# Reliability of supply

## Division 2 - Standards for the interruption of supply to individual customers

### Code requirement

Division 2 provides for the maintenance of supply and management of interruptions to customers, both in terms of the duration and number of interruptions. Division 2 addresses:

- Provision of supply with the minimum number and duration of interruptions (section 9)
- Consideration of providing alternative supply if the interruption is expected to be significant, its effect substantial or if the customer has special health needs that require continuous supply (section 10(2))
- Allowance for planned interruptions if the customer is notified within a suitable time and where the duration is under 6 hours, or under 4 hours for temperatures over 30 degrees or north of the 26th parallel (section 11)
- Provisions for the distributor to remedy the causes of interruptions or enter into alternative arrangements if the supply to small use customers has been interrupted for more than 12 hours continuously or more than:
  - 9 times in the Perth CBD or urban areas
  - 16 times in other areas
 in the preceding 12 months to 30 June and it is considered that the prescribed standard is unlikely to be met for the customer (section 12(3)).

### Mechanisms and systems designed to meet Code requirements

#### Number and duration of interruptions

For the purposes of the reporting metrics used by Western Power to monitor supply reliability, the data is drawn from Western Power's Data Warehouse, which houses all TCS outage data.

#### Monitoring number of interruptions

Western Power's reporting processes, on a monthly and annual basis, provide for the number of interruptions to be considered by Western Power management. The following metrics are reported on an annual basis as part of the Network Quality and Reliability of Supply report, as well as forming part of the monthly Network Performance Branch reporting:

- The percentage of customers within the Perth CBD who experienced no outages
- The percentage of customers within the Perth urban area who experienced 9 outages or more
- The percentage of customers within the Perth rural area who experienced 16 or more outages.

### Monitoring of length of interruptions

Western Power's reporting processes, on a monthly and annual basis, provide for the length of interruptions to be considered by Western Power management. The following metrics are reported on an annual basis as part of the Network Quality and Reliability of Supply report, as well as forming part of the monthly Network Performance Branch reporting:

- The percentage of customers within the Perth CBD who experienced total outage minutes of less than 30
- The percentage of customers within the Perth urban area who experienced total outage minutes of less than 160
- The percentage of customers within the Perth rural area who experienced total outage minutes of less than 290.

### **Alternate supply**

Western Power is required to (in accordance with section 10(2) of the Code) consider providing customers with alternate supply if an interruption is expected to be significant, the effect is substantial or if the customer requires continuous supply (e.g. for life support customers).

Through discussions with the Contract Strategic Programs Manager and examination of the "Identification and notification of customers with life support equipment/sensitive customers affected or potentially affected by planned interruptions" procedure, we determined that Western Power has maintained the following processes for the provision of alternate supply:

- As part of the works delivery process, the Distribution Network Access Request (DNAR) requestor is required to log a DNAR with the NOCC. This DNAR identifies the work required, whether any customers will be affected by the planned outage and if so, whether Customer Assist is requested to perform the customer notifications
- The DNAR requestor must have completed prerequisite training, be listed as an authorised DNAR requestor on the official DNAR requestor list and have the required authorisation level
- The DNAR requestor is required to:
  - Identify all affected customers ( affected LSE customers and non-LSE customers) in the planned interruption area
  - Perform a proximity check to identify all LSE customers in the area. If no LSE customers are identified the DNAR requester must send a map of Geoview identifying the closest LSE customer and confirm they are not in the planned interruption area
  - Identify any other sensitive customers (utilities, service providers and sensitive load customers)
  - Ensure that a field check is undertaken to confirm the network connectivity for the planned interruption area
  - Submit all evidence of planning to the Evidence Retention Team (ERT)
- A LSE planned outage checklist is used to ensure all steps required for the notification of LSE customers are completed. The checklist is submitted with the completed DNAR for peer review, particularly to verify the existence of required documentation for the

planned interruption. The peer review is completed by a person independent of the activities subject to review

- Should alternate supply be required (e.g. generator) the Scheduling team liaise with the Emergency Generator Response Group, which is responsible for arranging and connecting a generator at the customer's premise. This action is built into the switching schedule for the works, which is the responsibility of the works Team Leader
- The Emergency Generator Response Group is required to liaise with the relevant Team Leader for the required alternate supply works. Once the generator is installed and operational, the Team Leader is notified and work can be carried out.

## **Planned interruptions**

### Scheduling of planned interruptions

Planned interruptions, as defined by section 3 of the Code enables Western Power to de-energise customer premises for scheduled maintenance and other tasks. We determined that Western Power has long established processes for scheduling planned interruptions in accordance with Division 2 of the Code.

Western Power's processes for liaising with customers encompasses all of its customer base, including small use customers to large retail customers, schools and industrial areas. When arranging a planned interruption Western Power DNAR requestors schedule works to be complete and lodge a DNAR to the NOCC for program writing and development of the switching schedule.

The switching schedule is required to consider:

- The length of the interruption, in accordance with the timeframes of section 11(2) of the Code. Specifically, work to not to be conducted longer than six hours or only four hours, due to weather (further described below)
- Whether the customer can be appropriately notified in timeframes required, prior to work being undertaken
- Whether a physical check of the planned interruption area has been completed to ensure the recorded isolation points and switches are reflected on site
- If the customer is a sensitive customer (e.g. life support), whether alternate supply requirements have been addressed in accordance with the above processes. Note that it is the responsibility of the of the group scheduling the work for considering alternate supply needs
- Whether the LSE planned outage and fieldwork checklist has been completed by listing all steps required for completion prior to the planned outage
- If the customer has been subject to consecutive or repeat interruptions
- The weather, in accordance with the Management of Planned Outages in Hot Weather Guidelines. The Guidelines outline the following parameters and constraints for scheduling planned outages during forecasted hot weather:
  - All work less than four hours can proceed as planned
  - Conditional work (e.g. greater than four hours and temperature is greater than 30 degrees) can be undertaken if the schedule can demonstrate that all practical options to maintain supply have been considered
  - Work between four and six hours is to be rescheduled where the forecast temperature at the time of the planned interruption is greater than 38 degrees.

Where work is greater than six hours and the forecast temperature is greater than 35 degrees, scheduled work is to be rescheduled.

**Table 1 – Hot Weather Guidelines (extract from Guidelines)**

Bureau of Metrology forecast	Outage timeframe		
	All outages less than 4 hours	Outages between 4 and 6 hours	Outages greater than 6 hours
Less than 30 degrees	OK	OK	Conditional
Between 30 and 35 degrees	OK	Conditional	Conditional
Between 35 and 38 degrees	OK	Conditional	Reschedule
Greater than 38 degrees	OK	Reschedule	Reschedule

Through discussion with the Operations Reliability and Capacity Manager – Network Operation and consideration of the Hot weather Guidelines we determined that:

- Western Power is reliant of the DNAR requestor and the Program Writer for determining whether or not ‘conditional’ work should proceed
- A checklist has been implemented in support of Western Power’s existing Hot Weather Guidelines. The checklist is to be used to confirm that the required considerations and steps have been taken prior to the planned outage. From October 2012, this checklist has been approved to be used for all planned outages
- The DNAR requestor is required to estimate the weather when lodging the DNAR and request for notification to Customer Assist utilising the guidance in the Hot Weather Guideline, which estimates the temperature using historical data from the Bureau of Meteorology
- Official Bureau of Meteorology estimates for Perth continue to be used to create a temperature guideline for planned outages by outlining the average temperature ranges throughout the day based on historic data. The estimates are used to forecast the best time for a planned outage in compliance with the Code. Note that these estimates are used for planning purposes only, whilst the Hot Weather Guidelines combined with actual temperatures will dictate the planned outage times on the day (including decisions to continue or postpone work).

#### Customer notification of planned interruptions

Through discussions with the Manager Strategic Programs, Distribution Division and examination of new/enhanced work instructions and procedures, we understand that the following two processes for notifying customers of Western Power’s intention to interrupt supply have been further strengthened throughout the year ending 30 June 2012, particularly in relation to LSE customers:

In relation to its obligations for notifying LSE customers, Western Power implemented the following additional work instructions and guidelines in the period April to June 2012 to ensure compliance by Western Power staff and Distribution Delivery Partners (external contractors):

- “Notification to Life Support & Sensitive Customers affected by Planned Outages”. The Manager Strategic Programs, Distribution Division advised that this procedure was rigorously developed, reviewed and endorsed through an extended enterprise team
- LSE Planned Interruption Checklist “Planning, Scoping & DNAR”
- “Planned outages Type 1 – LSE work instructions (ERT)” – specific to the requirement of the Evidence Review Team to validate completeness and compliance.

Method of Customer Notification

Method	Description
Letter notification	<p>Western Power has developed a Customer Assist Notification Process Guideline to manage the notification process for planned interruptions. The process utilises ENMAC and DFIS to identify customers affected by the planned interruption. Customer Assist is only able to notify customers with HV outages that are requested via DNAR as the report generated identifies affected transformers using HV isolation points. Therefore, if LV work is not within the HV isolation point, the customer cannot be identified automatically and must be notified manually (i.e. hand carding).</p> <p>Customer Assist requires 10 business days notice to notify customers in the metropolitan area and 11 business days for rural customers. Should the scheduler be unable to meet the Customer Assist timeframes, Western Power staff/contractors are required to 'hand card' 3 business days in advance of the scheduled planned outage date (in accordance with Western Power's Customer Charter). In the case of LSE customers notifications are required to be delivered no later than 8 days prior to the planned interruption for metropolitan customers and 9 days for country customers.</p>
Hand carding and confirmed LSE customer contact	<p>Western Power has further strengthened its hand carding process for notifying relevant customers of planned interruptions requiring staff or contractors to manually letter box drop Western Power branded cards with details of the planned interruption. Section 11(1)(b) of the Code requires customers to be notified at least 72 hours prior to the commencement of the planned interruption. Western Power, according to its Customer Charter, has set the minimum standard (for non LSE or SL customers) to be at least three business days prior to work being conducted.</p> <p>In the case of LSE customers, Western Power requires:</p> <ul style="list-style-type: none"> <li>• At least 8 business days prior to the planned interruption, Customer Assist to send letters by courier to all affected LSE customers to obtain acknowledgement that such customer has received written notification of the planned interruption</li> <li>• At least 5 business days prior to the planned interruption, Customer Assist to attempt to contact the LSE customer by telephone on a recorded line</li> <li>• If Customer Assist has been unable to reach the LSE customer by telephone on the first attempt, Customer Assist is to make a second attempt to contact the LSE customer by telephone on a recorded line at least 4 business days prior to the planned interruption.</li> </ul> <p>We further determined that Western Power:</p> <ul style="list-style-type: none"> <li>• Has drafted the hand notification process (June 2012 version) to provide clear procedural guidance for staff, contractors and management (where approvals are required)</li> <li>• Has implemented a checklist to confirm the completion of a drop off to the customer. The checklists are required to be maintained for independent audit which is completed on all customers who have been notified.</li> </ul>

### Service standard payments

Western Power will pay a service standard payment to customers, upon request, for failure to notify of a planned interruption. All service standard payments are logged into a spreadsheet for tracking purposes by the Customer Assist team.

Western Power's process for validating the claim involves determining whether:

- A planned outage was scheduled, including verification that the NMI is in a scheduled outage area, the planned outage was greater than 12 hours, and verification of the customer's meter number and postal address. In the event that a claim does not pass these checks, it is subject to revalidation and then rejection upon a second failure to pass
- There is any evidence to indicate that the customer would have been notified. Primarily, the validation can only be performed where the Customer Assist team has been responsible for notifying the customer and is able to source a copy of the letter sent.

### **Remedy the causes of unplanned interruptions**

Through discussions with Western Power staff and examination of documentation, we determined that Western Power has long established processes in place to remedy the causes of unplanned interruptions. The primary system utilised is TCS, which identifies faults on the network enabling the NOCC to respond and allocate, on a prioritised basis, resources to remedy the interruption.

### **Mechanisms designed to monitor compliance with Code requirements**

With reference to section 11 of the Code, which defines what is considered to be a planned interruption, there are a number of scenarios where the 'planned' status of an interruption can be challenged.

During the year to 30 June 2012, Western Power continued to consider the adequate interpretation and definition of 'planned interruptions' and 'breaches' as they relate to Division 2 of the Code. In July 2012, Western Power came to a clear conclusion as to what constituted a breach of section 9 of the Code, enabling the NOCC to be in a position to accurately notify the Network Performance Branch in a timely manner as to what interruptions are considered to be 'breaches' (i.e. not allowable planned interruptions) of the requirements of Division 2 of the Code for monitoring and reporting purposes.

We also observed that the Network Performance Branch recently implemented a checklist and set of TCS data validation rules to assist in the verification of any compliance breaches for reporting purposes. To date, a procedure or process has not been developed to guide individuals on how to use the checklist and validation rules, and what constitutes a compliance breach (refer to *opportunity for improvement 1/2012*).

### **Opportunity for improvement**

#### **1/2012 – Validation checklist – formal procedure**

In support of its validation checklist and data validation rules to flag potential unplanned outages to assist in the verification of any compliance breaches for reporting purposes (i.e. to determine whether an 'unplanned' outage has occurred), Western Power should consider developing a procedure or guideline to assist users in:

- Using the checklist and validation rules
- Determining what constitutes a compliance breach.

## Division 3 - Standards for the duration of interruptions of supply in particular areas

### Code requirements

Part 2, Division 3 provides standards for the duration of interruptions of supply in particular areas. Section 12 of the Code provides that as far as is reasonably practicable the average length of interruptions must be less than:

- 30 minutes within the Perth CBD
- 160 minutes for urban areas other than the Perth CBD
- 290 minutes in any area of the State.

The above standards are to be calculated as an average of the yearly averages over 4 years.

### Mechanisms and systems designed to meet Code requirements

Western Power has developed a Reliability Key Performance Indicator (KPI) Calculation Guide (the Guide) to assist with determining the average length of interruptions in both urban and rural areas. The purpose of the Guide is to describe the reliability indicators in terms of calculations that Western Power reports at the corporate and regulatory level during the Access Arrangement 2 (AA2) period. Section 3 of the Guide states that, “an ‘outage’ refers to any interruption lasting more than one minute”, which aligns to section 3 (definitions) of the Code. Outages lasting less than one minute are recognised as ‘momentary interruptions’ and are not captured under these performance metrics.

To determine the average length of interruptions in accordance with Part 2, Division 3, Western Power utilises the System Average Interruption Duration Index (SAIDI), which:

- Represents the average number of minutes each customer is without supply during a four year period, annualised over 12 month period on a particular network
- Is the sum of the duration of each customer interruption lasting more than one minute for each of the four financial years, divided by the average of the total number of connected customers. The four SAIDIs are averaged to give a four year annualised figure
- Is reported by the following categories:
  - Perth CBD
  - Perth metropolitan area (except for the CBD), Mandurah, Albany, Bunbury, Geraldton and Kalgoorlie
  - South West Interconnected System (SWIS)
  - Isolated networks
  - Other areas i.e. Rural, which represents the remainder of the SWIS.

### Mechanisms designed to monitor compliance with Code requirements

On a monthly basis, the Network Performance Branch reports on a range of metrics, including SAIDI for the Perth CBD, urban and rural demographics. A combination of the records contained in the data warehouse (which stores all logs made within the TCS), power quality complaints from DQM and EOPS are used to create the Branch report. The Branch report reflects the SAIDI targets, which are consistent with current Access Arrangements. The SAIDI metrics include analysis of actual v target performance by month.

# Variations

## Division 4 – Variation of obligations under this Part

### Code requirements

Variations of obligations under Part 2 provide for:

- Review and approval by the Minister or alternative requirements (section 14)
- Agreement between transmitter/distributor and the customer of extensions and modifications to the standards (section 15).

### Observation

Division 4 of the Code provides for:

- Western Power to apply to the Minister for an exemption from compliance with or the replacement of a provision of Part 2 of the Code. If granted the minister will, by instrument, exempt Western Power from compliance with the respective provision (section 14)
- Western Power to negotiate with a customer, in writing, that a provision of Part 2 of the Code is excluded or modified in relation to the supply of electricity (section 15).

The Risk and Compliance Branch confirmed that Western Power has not:

- Applied for or obtained an instrument from the Minister to exempt or replace provisions under Part 2 of the Code
- Negotiated with a customer an amendment or exclusion to the provisions of Part 2 of the Code.

### Conclusion

For the purposes of the 2011/12 Network Quality and Reliability of Supply audit, Western Power has no compliance obligations under Division 4 of the Code.

# Appendix A – Compliance requirements

Section	Requirement
<b>Division 1</b>	
5(1)	A distributor or transmitter must, as far as reasonably practicable, ensure that electricity supply to a customer's electrical installations complies with prescribed standards ( <i>in sections 6(2) and 7, relating to voltage fluctuations and harmonics</i> ).
8	A distributor or transmitter must, so far as reasonably practicable, disconnect the supply of electricity to installations or property in specified circumstances, unless it is in the interest of the customer to maintain the supply.
<b>Division 2</b>	
9	A distributor or transmitter must, as far as reasonably practicable, ensure that the supply of electricity is maintained and the occurrence and duration of interruptions is kept to a minimum ( <i>section 11 specifies the planned interruptions that are allowable (not a breach)</i> ).
10(1)	A distributor or transmitter must, so far as reasonably practicable, reduce the effect of any interruption on a customer.
10(2)	A distributor or transmitter must consider whether, in specified circumstances, it should supply electricity by alternative means to a customer who will be affected by a proposed interruption.
12(3)	A distributor must take prescribed action in the event of a significant interruption to a small use customer.
<b>Division 3</b>	
13(2)	A distributor or transmitter must, so far as reasonably practicable, ensure that customers in specified areas do not have average total lengths of interruptions of supply greater than specified durations.
13(3)	The average total length of interruptions of supply is to be calculated using the specified method.
<b>Division 4</b>	
14(8)	A distributor or transmitter must, on request, provide to an affected customer a free copy of an instrument issued by the Minister and of any notice given under section 14(7) of the Electricity Industry (Network Quality and Reliability of Supply) Code 2005.
15(2)	A distributor or transmitter that agrees with a customer to exclude or modify certain provisions must set out the advantages and disadvantages to the customer of doing so in their agreement.

Source: *Electricity Compliance Reporting Manual May 2011* published by the Economic Regulation Authority

# Appendix B – References

## Key Western Power staff participating in the audit

Staff member	Position	Branch
Dino Patroni	Team Leader	Power Quality Management
Nigel Wilmot	Senior Networks Engineer	Power Quality Management
Dean Frost	Operations Reliability and Capacity Manager	Network Operations
Rudy Bake	Operational Standards Development Manager	Network Operations
Mel Sklenars	Customer Contact Centre Team Leader	Customer Assist
Aaron Gibbons	Performance Monitoring and Benchmarking Team Leader	Network Performance
David Wilkes	Lead Data Warehouse ETL Specialist	Information Technology
Dave Phelan	Contract Analyst	Information Technology
Howard Buckley	Contract Strategic Programs Manager	Strategic Programs
Malcolm Scott	Senior Safety Investigator	Strategic Programs
Geoff Barnett	Audit & Process Team Leader	Network Performance
Mukul Mahajan	Senior Asset Systems Engineer	Network Performance
Ian Gibb	Asset Management Systems Manager	Network Performance
Emily Saxey	Compliance Advisor	Risk and Compliance
Carolyn Gibbon	Compliance Consultant	Risk and Compliance

## Key documents and other information sources examined

- Presentations to inform the audit:
  - Network Performance, Network Performance Monitoring and Benchmarking Branch
  - Network Operations, System Management NOCC – Reliability
  - Network Performance, LV Networks Team – Power Quality
  - Distribution, Strategic Programs - Hand Carding
  - Corporate Services IT Branch
- Remedied compliance failures - specific to NQ&RS Code (CURA report, July 2012)
- Data validation checklist and rules

**Deloitte:** 2011/12 Network Quality and Reliability of Supply Code Audit

22

*This report is intended solely for the use of Western Power for the purpose of its reporting requirements under section 26 and 27 of the Code. We do not accept or assume responsibility to anyone other than Western Power for our work, for this report, or for any reliance which may be placed on this report by any third party for any other purpose*

- Network performance branch monthly KPI report (July 2011 – June 2012)
- Life Support Equipment Obligations training presentation
- Planned outages overview training presentation
- DNAR requests and attached planned outages checklist - February and March 2012
- Guidelines for the management of planned outages in hot weather (Version 3)
- Summary of management of planned outages in hot weather
- Customer service centre Extended Outage Payment Scheme process - March 2012
- Extended Outage Payment Scheme process map - draft
- Power Quality complaint handling process map - June 2012
- Power Quality KPI performance report - June 2012
- Power Quality monitoring fact sheet - draft
- Configuring Power Quality Instruments for Measurements and storing the data procedure - June 2012, draft
- Distribution Network Planning Guidelines - December 2010
- PQ Meters monitoring and maintenance process plan - draft
- Power Quality monitoring system deployment methodology - draft
- Reporting PQ non-compliance procedure - June 2012, draft
- Listing of database accounts with edit privileges to data warehouse - July 2012
- Life Support Equipment evidence retention team work instructions - June 2012, draft
- Procedures for the identification and notification of customers with life support equipment and other sensitive customers affected or potentially affected by planned interruptions - July 2012, draft
- 2011 NQRS Audit PAIP – Final update to Deloitte – 26 July 2012
- Additional audit interview questions spread sheet – July 2012.

# Appendix C – Voltage fluctuation and harmonic tables

**Table 1 – Voltage fluctuations**

Compatibility levels	
$P_{st}$	1.0
$P_{lt}$	0.8

**Table 2 – Harmonics**

Compatibility levels for harmonic voltages (in percent of the nominal voltage)					
Odd harmonics Non multiple of 3		Odd harmonics Multiple of 3		Even harmonics	
Order h	Harmonic voltage %	Order h	Harmonic voltage %	Order h	Harmonic voltage %
5	6	3	5	2	2
7	5	9	1.5	4	1
11	3.5	15	0.3	6	0.5
13	3	21	0.2	8	0.5
17	2	>21	0.2	10	0.5
19	1.5			12	0.2
23	1.5			>12	0.2
25	1.5				
>25	0.2 + 1.3 (25/h)				

Note – Total harmonic distortion (THD): 8%